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LOBLOLLY PINE RELEASE STUDY

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LOBLOLLY PINE RELEASE
Report #4

by
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Abstract. This study included two treatments: no release and mist-blowing with a tractor-mounted mist-blower during the fourth growing season. Hardwood competition was fairly severe when the release was done. At age 19, the mist-blown plots averaged 25 percent more basal area and 28 percent more volume in standard cords than the check plots.

INTRODUCTION

This is the fourth in a series of Occasional Reports concerning release of loblolly pine seedlings from hardwood competition. This particular study was installed in Stand 12 of the Hawkins 8 Management Unit on the Pocahontas State Forest, which is located on the fall line, about ten miles south of Richmond, Virginia. The previous stand of mixed pine and hardwood was cut during the fall of 1964. Site preparation consisted of a prescribed burn in October, 1965, and seedlings were planted in the spring of 1966.

In June, 1969, during the fourth growing season, a Potts mist-blower mounted on a small crawler tractor was used to apply two pounds active ingredient of 2,4,5-T per acre. A small area on one side of the tract was left untreated to serve as a check area. In October, 1969, 100 mil-acre plots were systematically located in both the check area and in that part of the adjacent mist-blown area in which permanent growth plots were later installed (see Figure 1). Height of each loblolly pine was measured to the nearest one-half foot. Estimates of loblolly pine stocking and average height, based on this sampling, are presented in Table 1. In the mist-blown area, about ten percent of the seedlings were run-over and destroyed by the tractor during the spraying operation (on the 100 mil-acre plots, 11 seedlings that were destroyed by the tractor were tallied).

FIGURE 1. Layout of study and growth plots

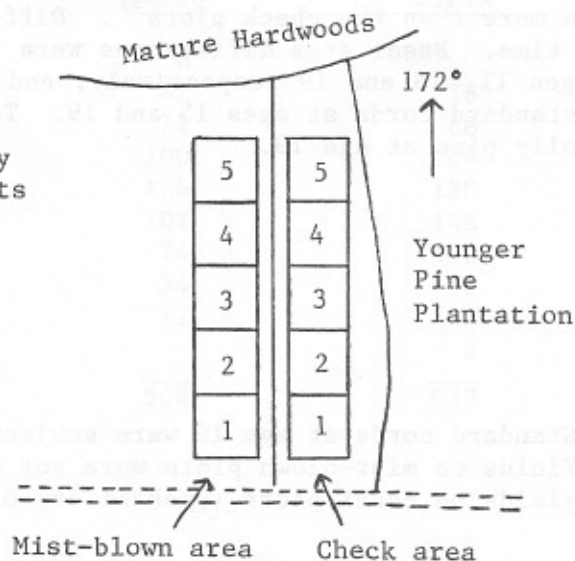


Table 1. Estimated number and height of loblolly pine seedlings four seasons after planting.

Treatment	Number per acre	Total Height (feet)	
		Average	Range
Check	910	6.3	1½ to 10
Mist-blown	850	6.3	1½ to 10½

Hardwood vegetation was similar on the check and mist-blown areas before treatment. The site is better than average, and competition from hardwood sprouts was fairly severe when the mist-blowing was done. The mist-blowing did a reasonably good job of "killing-back" most hardwoods, but the majority resprouted and resumed growth. Even though overtopping of pine seedlings was reduced, considerable side shading of pine crowns still occurred, and some persisted until the final measurement at age 19.

GROWTH PLOT INSTALLATION

Permanent one-tenth acre growth plots were installed in November, 1976, after 11 growing seasons. Ten plots were installed, five each in the check and mist-blown areas, with a one-half chain buffer in between (see Figure 1).

The plots were measured at the time they were installed (i.e., after 11 seasons), and were remeasured at ages 15 and 19. Each time, the diameter at breast height of each loblolly pine was measured to the nearest inch, and a sample of trees in each diameter class was measured for total height to the nearest foot, noting which trees were dominant or codominant. Total height of all dominant and codominant hardwoods were measured at ages 15 and 19. At age 19 all hardwoods over .5 inch DBH were tallied by species, DBH, and crown class.

RESULTS AND DISCUSSION

A summary of loblolly pine data for the three measurements is presented in Table 2. At age 19, mist-blown plots averaged 6.7 standard cords more than the check plots^{1/}. Differences due to release increased with time. Basal area differences were 18.5, 27.2, and 29.8 square feet at ages 11, 15 and 19 respectively; and yield differences were 4.8 and 6.7 standard cords at ages 15 and 19. Table 3 presents stand tables for loblolly pine at age 19.

1/ Standard cords at age 19 were subjected to an analysis of variance. Yields on mist-blown plots were not significantly greater than yields on check plots (probability of greater F = .141).

Table 2. A summary of loblolly pine data for check and mist-blown plots at ages 11, 15, and 19 years: number of trees per acre, average DBH, basal area per acre, standard cords per acre, and average height of dominant and codominant trees.

Age	Check						Mist-blown					
	Plot	No.	DBH	B.A.	Cds.	Ht.	Plot	No.	DBH	B.A.	Cds.	Ht.
11	1	510	3.51	40.1	-	29.8	1	660	4.45	79.1	-	32.4
	2	670	4.02	66.1	-	32.8	2	840	4.61	103.8	-	32.8
	3	810	3.90	75.3	-	32.9	3	790	4.73	103.1	-	31.9
	4	730	4.59	89.8	-	33.1	4	710	4.62	90.4	-	32.9
	5	630	4.67	81.2	-	35.2	5	510	4.82	68.7	-	33.2
Means		670	4.14	70.5	-	32.8	Means	702	4.65	89.0	-	32.6
15	1	470	4.68	63.7	7.2	39.2	1	660	5.52	119.8	17.1	41.4
	2	630	4.92	92.5	12.6	41.6	2	810	5.59	147.2	21.1	41.7
	3	730	4.97	108.5	15.1	42.1	3	760	5.64	142.2	22.9	43.4
	4	710	5.52	126.1	20.0	44.0	4	660	5.92	134.4	21.4	40.6
	5	610	5.70	116.9	19.4	45.2	5	490	5.94	99.8	16.1	43.2
Means		630	5.16	101.5	14.9	42.4	Means	676	5.72	128.7	19.7	42.1
19	1	420	5.57	78.0	12.6	45.9	1	610	6.43	146.6	28.3	49.0
	2	550	6.00	117.2	23.5	50.1	2	750	6.24	168.9	32.0	49.5
	3	650	5.65	123.0	23.5	49.9	3	720	6.36	169.1	35.4	50.5
	4	690	6.04	147.9	29.3	50.5	4	620	6.53	151.9	32.0	50.2
	5	530	6.77	141.5	31.5	53.1	5	460	6.70	120.1	26.3	50.6
Means		568	6.01	121.5	24.1	49.9	Means	632	6.45	151.3	30.8	50.0

Table 3. Average number of loblolly pine per acre by DBH class at age 19.

DBH	Check Plots	Mist-Blown Plots
2	6	
3	42	16
4	72	68
5	100	104
6	126	130
7	102	148
8	74	100
9	34	56
10	12	8
11		2
Totals	568	632

The study area gently slopes to the south, and both #5 plots occupy a lower-slope position above a cove site that supports an excellent stand of mature hardwoods. The whole study area could have been regenerated to hardwoods quite successfully, and probably would have produced a stand of good quality. It was obvious early in the study that some hardwood sprouts were growing fast enough to stay in the canopy for a long time. At the age 15 and 19 measurements, total heights of all dominant and codominant hardwoods were measured, and on the average they were equal to average heights of dominant and codominant loblolly pine. The numbers of dominant and codominant hardwoods increased from a total of 7 on the five check plots and none on the five mist-blown plots at age 15, to a total of 21 on the check plots and 2 on the mist-blown plots at age 19. Of these 23 trees at age 19, there were 18 yellow poplar, 2 scarlet oak, and 1 each sweet gum, hickory and black cherry. It is not likely that the loblolly pines will overtop these dominant and codominant hardwoods, and the final stand will include a scattering of hardwoods, mostly yellow poplar.

A summary of average hardwood data from the final measurement at age 19 is presented in Tables 4 and 5. It is apparent that mist-blowing did not reduce total numbers of hardwoods very much, but did reduce their rate of growth. On the average, mist-blown plots had 19 percent fewer hardwoods but 43 percent less hardwood basal area than check plots. Considering only hardwood basal area in intermediate, codominant and dominant trees, there was an average of 13.4 square feet on the check plots and 3.2 square feet (76 percent less) on the mist-blown plots. Cordwood yields of loblolly pine at age 19 are related to the amount of hardwood present at age 19. Figure 2 shows pine cordwood yields relative to basal area of intermediate, codominant and dominant hardwoods at age 19, for the ten plots. A simple linear regression fitted to these data accounted for 66 percent of the variation in cordwood yields^{2/}. A regression of yields over total hardwood basal area (all trees greater than one-half inch DBH) accounted for only 41 percent of the variation in yields. Hardwoods that were over-topped by age 19 had less affect on pine yields than hardwoods that were still competing for crown growing space at age 19.

^{2/} Estimated standard cords = $33.09 - .678 (\text{hardwood basal area})$, $r^2 = .658$.

Table 4. Average numbers of hardwoods per acre by species and DBH class at age 19.

Species	Check Plots								Totals
	1	2	3	DBH 4	5	6	7	8	
Red oak	40	22	10	2	2	2			78
White oak	20	26	6	4					56
Yellow poplar	608	112	18	2	16	12	2	6	776
Hickory	232	110	42	14	2				400
Dogwood	678	224	14						916
Holly	504	70							574
Black gum	204								204
Sweet gum	34	14	12	16	4		2		82
Red maple	60	22	8	8	2				100
Beech	70								70
Black cherry	4	2		4	2				12
Miscellaneous	40	16	6	4					66
Totals	2,494	618	116	54	28	14	4	6	3,334

Species	Mist-blown Plots							Totals
	1	2	3	DBH 4	5	6	7	
Red oak	102	50	14	6	2			174
White oak	38	18	4					60
Yellow poplar	230	88	12	8	2	2		342
Hickory	212	20	4					236
Dogwood	642	132	4					778
Holly	558	36						594
Black gum	58							58
Sweet gum	6	2	2					10
Red maple	90	44	6	2				142
Beech	94	2						96
Black cherry	24	8	2				2	36
Miscellaneous	152	30	2					184
Totals	2,206	430	50	16	4	2	2	2,710

Table 5. Average numbers of hardwoods per acre by DBH class and crown class, and basal area by crown class, at age 19

DBH	Check Plots				Totals
	Over-topped	Intermediate	Codominant	Dominant	
1	2,494				2,494
2	618				618
3	104	12			116
4	18	34	2		54
5		12	16		28
6			12	2	14
7			2	2	4
8			2	4	6
Totals	3,234	58	34	8	3,334
B.A.	33.8	5.2	5.9	2.3	47.2

DBH	Mist-blown Plots				Totals
	Over-topped	Intermediate	Codominant	Dominant	
1	2,206				2,206
2	430				430
3	40	10			50
4	2	14			16
5		2	2		4
6			2		2
7		2			2
Totals	2,678	28	4	0	2,710
B.A.	23.5	2.5	.7	0	26.7

The plot that falls well below the regression line in Figure 2 is check plot #1. The performance of this plot has been quite different from the other four check plots. Average dominant and codominant loblolly pine height at age 19 averaged four feet shorter than the average of the five check plots (also four feet shorter than the next slowest growing check plot). For some reason, the pine seedlings on this plot had a harder time working their way through and above the competing hardwoods. The site index may be somewhat lower on this plot, but there is nothing in the topography or in hardwood species composition or vigor which would suggest a lower site index.

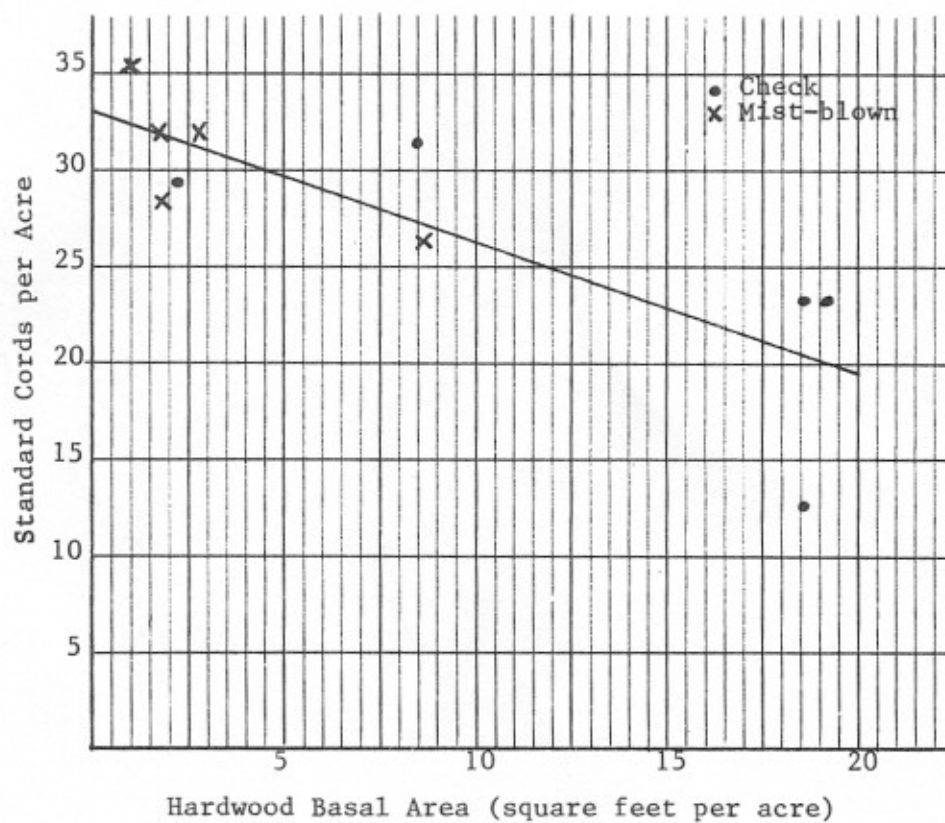


FIGURE 2. Pine cordwood yields at age 19 relative to basal area of intermediate, codominant and dominant hardwood trees.